

## THE GENERA *THYASIRA* AND *PARATHYASIRA* IN THE MAGELLAN REGION AND ADJACENT ANTARCTIC WATERS (BIVALVIA: THYASIRIDAE)

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### ABSTRACT

This study provides a revision of the Magellanic and Antarctic species of *Thyasira* and *Parathyasira*. The status of all species previously reported from the area is revised and a new species described. Five species are recognized as valid: *Thyasira falklandica* (Smith, 1885); ***Thyasira scotiana***, n. sp.; *Thyasira debilis* (Thiele, 1912), new combination; *Parathyasira magellanica* (Dall, 1901), new combination; and *Parathyasira dearborni* (Nicol, 1965), new combination. *Cryptodon fuegiensis* Dall, 1890, previously reported under the genus *Thyasira*, is reallocated into *Conchocele* Gabb, 1866. *Loripes pertenuis* Smith, 1881, and *Thyasira bongraini* Lamy, 1911, are considered *nomen dubia*.

Key words: Magellan Region, Southern Ocean, Thyasiroidea, diversity.

### INTRODUCTION

Thyasiridae Dall, 1901, is a world wide family of infaunal bivalves, occurring from shallow to hadal waters, including oxygen-poor and hydrogen sulfide-rich environments. In recent years, several studies contributed to the knowledge of this family: numerous new taxa were described and a number of taxonomic problems concerning the identity of several species clarified (e.g., Payne & Allen, 1991; Oliver & Killeen, 2002; Oliver & Sellanes, 2005; Oliver & Holmes, 2006; Barry & McCormack, 2007). However, as stated by Payne & Allen (1991) and Oliver & Killeen (2002), knowledge of the total diversity of the family is far from complete. This limitation arises not only from the difficulty in defining some of the taxa, but also from the few studies of species in some geographic areas. This is the case, for instance, for the Magellanic and Antarctic waters, from which seven species have been reported. The first described for this area, *Cryptodon falklandicus*, was named by Smith (1885), from the Malvinas (Falkland) Islands; afterwards, Dall (1890) described *Cryptodon fuegiensis* from the Magellan Strait, and subsequently *Thyasira magellanica* Dall, 1901, from the west coast of Patagonia. Later, Lamy (1911a) described *Axinus bongraini* based on a specimen from the Antarctic Peninsula, and Thiele (1912) described *Axinopsis debilis* from the Davis Sea. More recently, Nicol (1965) described the sixth species for the area, *Thyasira*

*dearborni*, from the Ross Sea. Furthermore, *Loripes pertenuis* Smith, 1881, was regarded as a thyasirid by Soot Ryen (1959).

The description of all the Magellanic and Antarctic species was based on shell characters of few specimens, if not on a single valve, as in the case of *Thyasira magellanica*, *Axinus bongraini*, and *Axinopsis debilis*. These descriptions disregarded such characters as the posterior area of shell (i.e., the presence / absence of auricle, development of folds and sulcus) or tubercles on hinge plate, which are important for species identification. None of the species was subsequently redescribed, and intraspecific variability was never examined. In addition, the anatomy of these species has been completely unknown. Under these conditions it is not strange that species have been frequently confused, and numerous synonymies erroneously inferred.

This paper undertakes a systematic revision of the thyasirid species occurring in the Magellan Region and adjacent Antarctic waters. All thyasirid species are redescribed and illustrated, their intraspecific variability examined, and gross anatomy studied.

### MATERIAL AND METHODS

This study is based on the material collected during several field trips at the Beagle Channel, Magellan Strait, Isla de los Estados, and the Scotia Arc Islands. Specimens were col-



lected with a dredge of 2 mm mesh size net, at depths between 5 and 587 m, and sorted from the sediment using stereoscopic microscopy. Additional specimens came from the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Argentina (MACN-In); Museo de La Plata, Argentina (MLP); National Museum of Scotland, Great Britain (NMSZ); National Institute of Water and Atmospheric Research, New Zealand (NIWA); Zoologisches Institut und Zoologisches Museum der Universität Hamburg, Germany (ZMH); and Bavarian State collection of Zoology, Germany (ZSM). All traceable type specimens housed at The Natural History Museum, Great Britain (NHM); the United States National Museum, Smithsonian Institution, USA (USNM); the Muséum National d'Histoire Naturelle, France (MNHN); and the Museum für Naturkunde, Germany (ZMB), were studied.

Shell morphology was studied and illustrated using scanning electron microscopy (SEM). Linear measurements were taken according to the

following criteria: L = maximum anteroposterior distance; H: maximum dorsoventral distance, perpendicular to L; W: maximum distance across the united valves. The mean values and standard deviations for the W/H ratio, and the number of measurements (n) are given. The number of specimens (sp/sps) and valves (v/vs) from each sampling station was also indicated.

For anatomical descriptions, specimens were decalcified by rinsing in 5% formaline with 2% acetic acid. Specimens were dissected under a stereoscopic microscope. The nomenclature of the soft parts anatomy and shell morphology follows Oliver & Killeen (2002); the description of the digestive gland refers to the shape of the lateral body expansions ("pouches").

Due to the numerous species misidentifications, the synonymies included in this study do not encompass the total literature for each species but only those cases for which it was possible to confirm the identity of the referred specimens.



FIG. 1. Known distribution of *Thyasira falklandica* (⊗) and *Thyasira magellanica* (●).

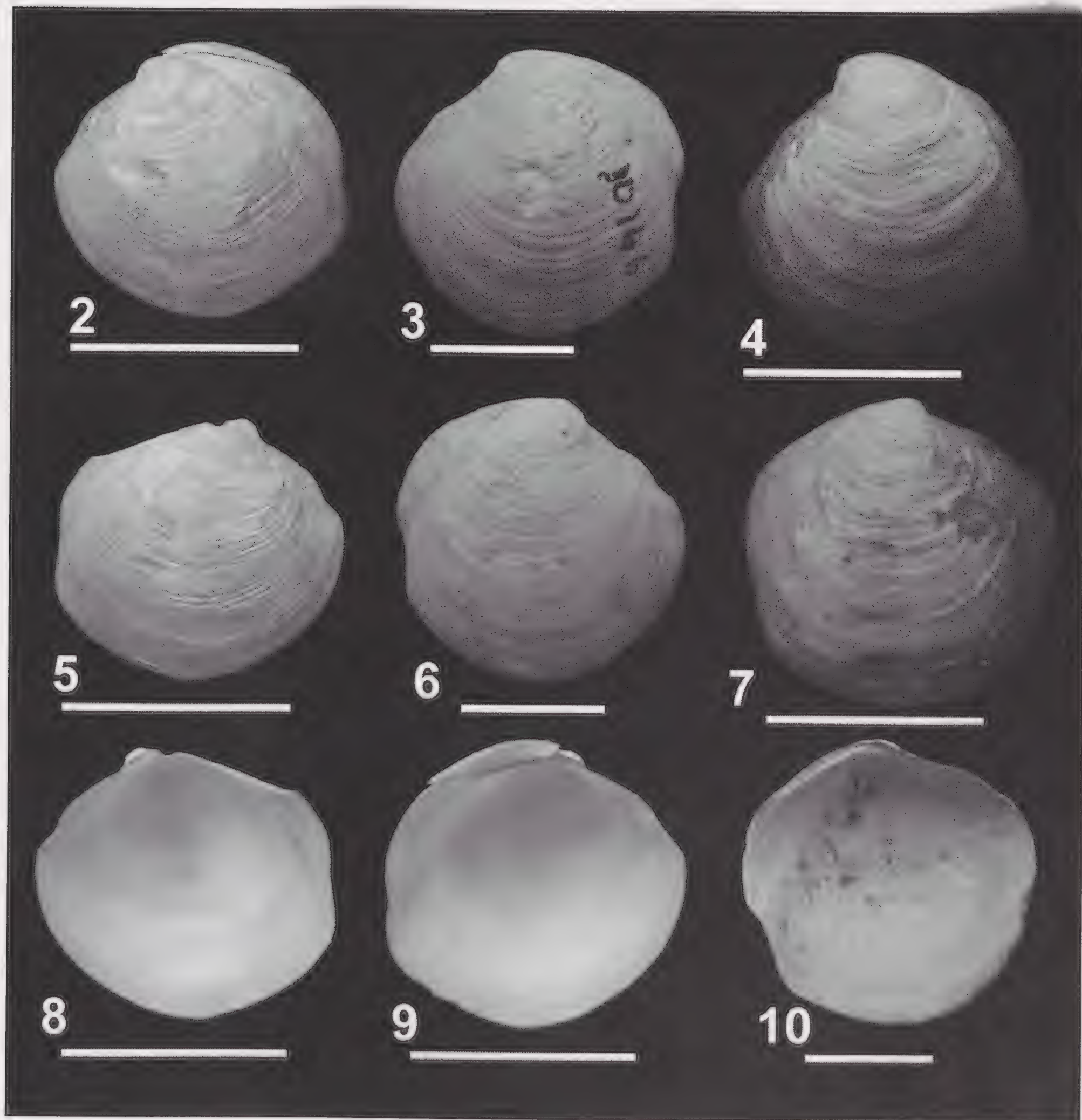


## SYSTEMATICS

Thyasiridae Dall, 1901

*Thyasira* Lamarck, 1818 (ex Leach, MS)Type Species: *Tellina flexuosa* Montagu, 1803 (by monotypy)*Thyasira falklandica* (Smith, 1885)  
Figures 1–10*Cryptodon falklandicus* Smith E. A., 1885: 190,  
pl. 14, fig. 3, 3a.*Thyasira falklandica*: Lamy, 1921: 300.

Type Locality

Station 316 R.V. Challenger [51°32'S,  
58°06'W], off Falkland [Malvinas] Islands, 3–5  
fms [5.5–9.2 m].

FIGS. 2–10. *Thyasira falklandica*. FIGS. 2, 5, 8, 9: One of the two syntypes (NHM 1887.2.9.2791-2); FIGS. 3, 4, 6, 7, 10: Specimens from Islas Malvinas (MACN-In 10166); FIGS. 2–4: Outer view left valve; FIGS. 5–7: Outer view right valve; FIG. 8: Inner view right valve; FIGS. 9, 10: Inner view left valve. Scale bars = 10 mm.



Material Examined

Two syntypes (NHM 1887.2.9.2791-2); Islas Malvinas [51°27'S, 59°00'W] (2 sps, MACN-In 10166; 2 sps, NHM 1963360).

Distribution

Only known with certainty from Malvinas (Falkland) Islands (Fig. 1).

Description

Shell large (maximum observed H = 19 mm), solid, inflated ( $W/H = 0.62 \pm 0.06$ ,  $n = 3$ ), subovate, nearly equilateral. Anterior end markedly pointed (Figs. 2–7). Anterior part of dorsal margin moderately long, sloping downwards straight or slightly concave near beaks, flattened distally. Anterior and ventral margins evenly rounded; sharp angle marking joining point of dorsal and anterior margins (Figs. 2–7). Ventral margin strikingly curved, sometimes slightly projecting in middle. Lunule wide. Posterior area of shell sulcate, producing variably marked posterior sinus; first and second posterior folds low, rounded (Figs. 2–7). Submarginal sulcus and marginal sinus not defined. Ligament internal, externally visible. Beaks low, wide, subcentral, anteriorly directed. Shell surface whitish, dull, sculpture represented by prominent growth lines. Pe-

riostracum thin, yellowish buff. Hinge plate narrow, edentulous (Figs. 8–10).

Remarks

The anatomy of *Thyasira falklandica* is unknown. However, based on the general shell morphology, the species is tentatively retained under *Thyasira*. Dias Passos et al. (2007) provided information on the anatomy of a thyasirid from South Shetland Islands, which they referred to as *Thyasira falklandica*; but from the illustrations they provided, the identification does not seem correct.

Melvill & Standen (1907) reported specimens from South Orkney as *Thyasira falklandica*. Re-examination of this material (NMSZ 1921.143.715) showed shells less inflated than those of topotypic specimens of *T. falklandica*, with the anterior end more projecting, an evenly rounded anterior margin, and a shallower posterior sulcus. Furthermore, in the specimens from South Orkney, the lunule is less evident and the shell surface shiny. This material seems to be conspecific with that figured by Oliver & Sellanes (2005, figs. 35–38) as *Thyasira falklandica*.

*Thyasira falklandica* is most similar to ***Thyasira scotiana***, from which it differs by having a larger, heavier, and more inflated shell, with ovate shell outline, and deeper posterior sulcus.

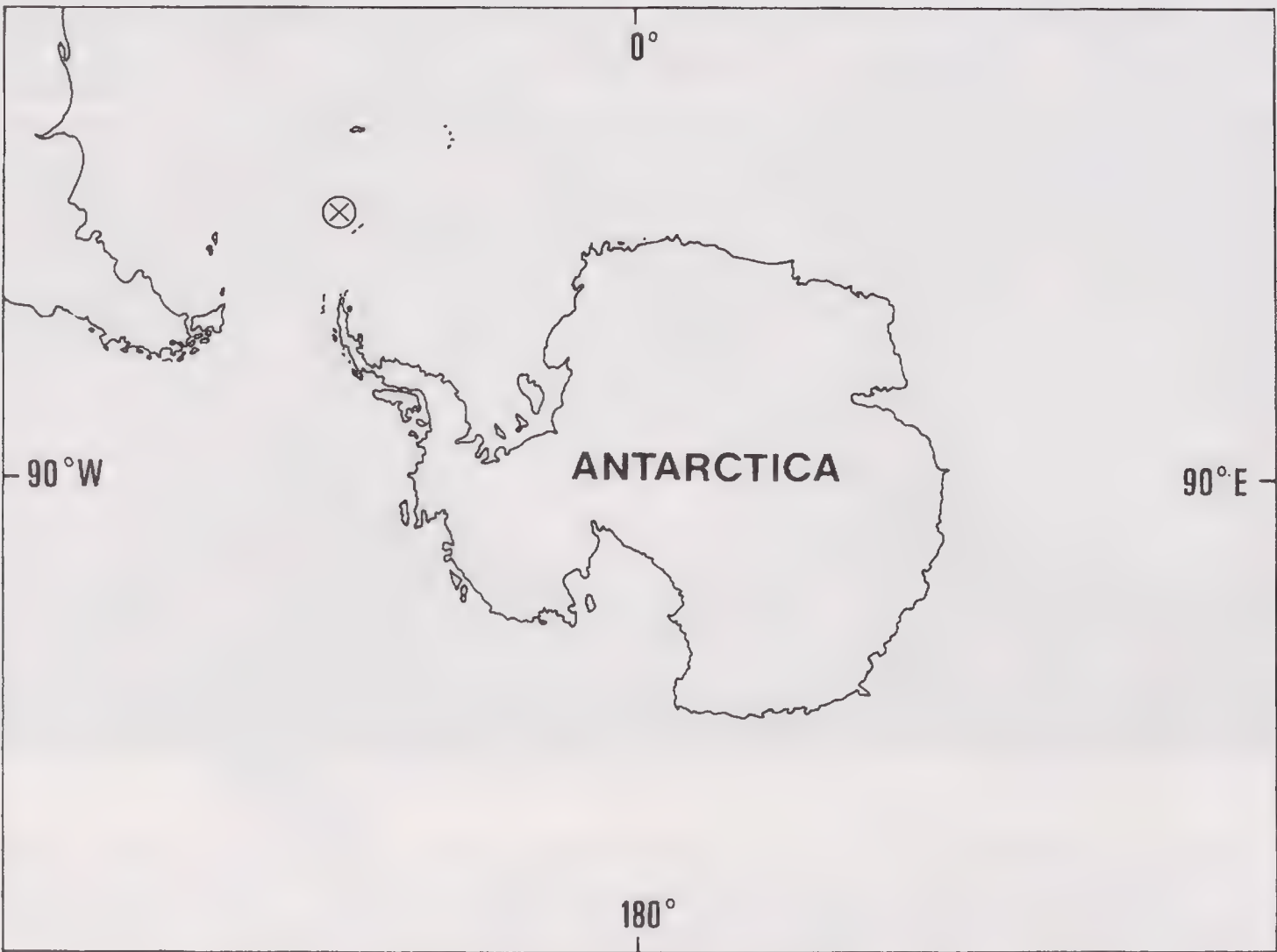


FIG. 11. Known distribution of *Thyasira scotiana*.



***Thyasira scotiana***, n. sp.

Figures 11–20

## Type Locality

South Orkney Islands [60°35'S, 45°30'W]  
(Fig. 11).

## Type Material

Holotype (MLP 5566-1) and 17 paratypes  
(MLP 5566-4).

## Etymology

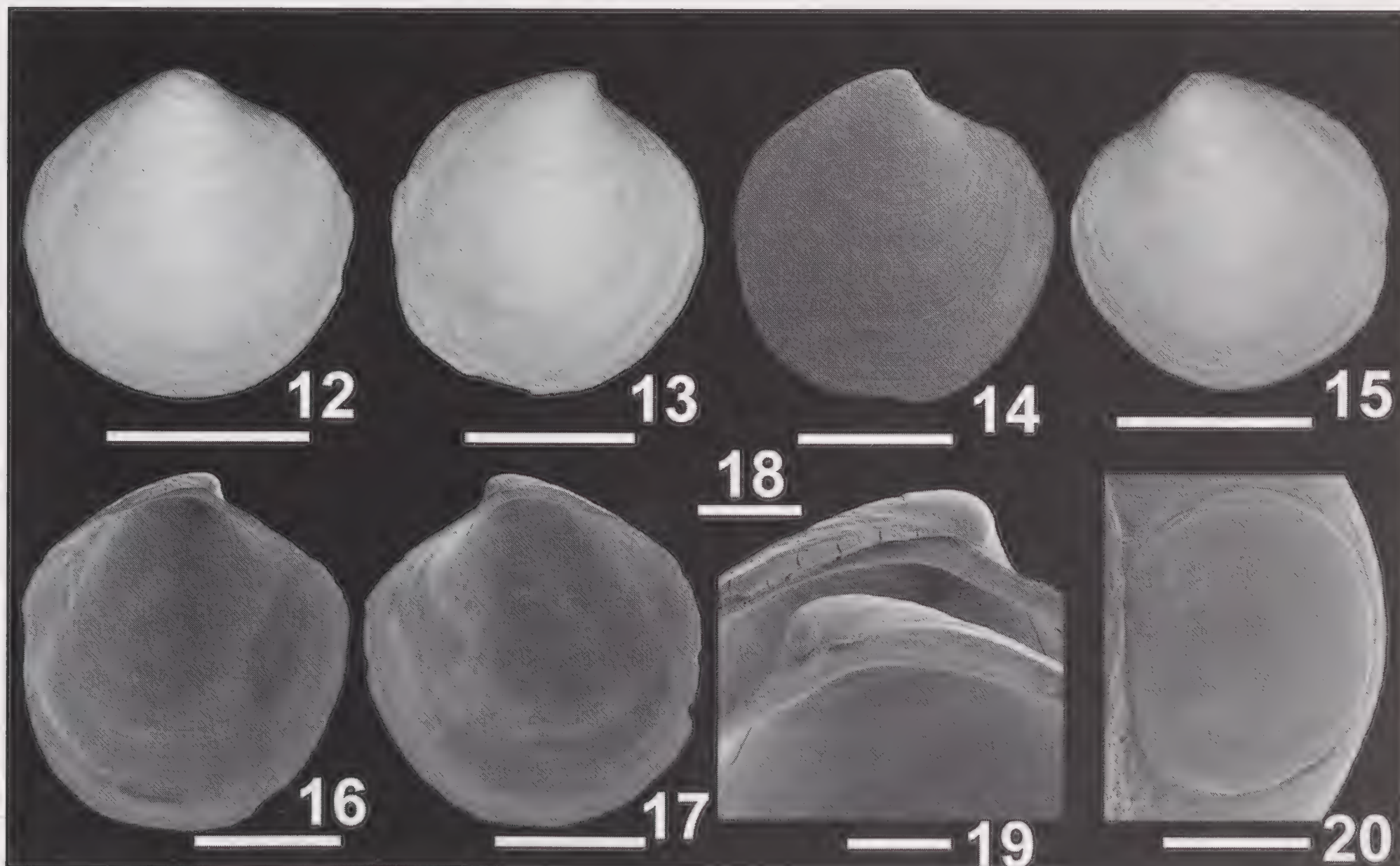
The species is named after the Scotia Sea,  
the geographic area of collection.

## Diagnosis

***Thyasira scotiana*** is characterized by a flat  
shell, with subcircular shell outline, strong first  
posterior fold, and large protoconch, of about  
210 µm in diameter.

## Description

Shell large (maximum observed H = 10 mm),  
approximately equilateral, subcircular, flat (W/H  
=  $0.49 \pm 0.02$ , n = 10), solid (Figs. 12–15). Ante-  
rior end rounded to slightly projecting. Anterior  
part of dorsal margin long, sloping downwards  
straight, forming a marked angle when joining  
anterior margin (Figs. 12–17). Anterior margin  
forming wide oblique curve with anterior por-  
tion of ventral margin, giving appearance of  
being distorted; posterior part of ventral margin  
rounded (Figs. 12–17). Sometimes ventral  
margin subangulate at junction of anterior and  
posterior parts (Fig. 15). Posterior area of shell  
weakly sulcated. Posterior margin truncated.  
First posterior fold wide, strong; second pos-  
terior ill defined (Figs. 12–15). Submarginal  
sulcus and marginal sinus not defined. Beaks  
low, acute, subcentrally located, anteriorly  
directed. Protoconch about 210 µm diameter;  
initial part sculptured with several folds, sym-  
metrically distributed with respect to main  
central axis (Fig. 20). Shell surface whitish,



FIGS. 12–20. ***Thyasira scotiana***. FIG. 12: Holotype (MLP 5566-1); FIGS. 13–20: Paratypes (MLP 5566-4); FIGS. 12–14: Outer view right valve; FIG. 15: Outer view left valve; FIG. 16: Inner view left valve; FIG. 17: Inner view right valve; FIGS. 18, 19. Detail of hinge. FIG. 18: Left valve; FIG. 19: Right valve; FIG. 20: Protoconch. Scale bars FIGS. 12, 13, 15 = 5 mm; FIGS. 14, 16, 17 = 2 mm; FIGS. 18, 19 = 500 µm; FIG. 20 = 100 µm.



dull, sculptured with markedly and irregularly distributed growth lines. Periostracum pinkish cream. Hinge plate narrow, slightly enlarged below beaks, edentulous (Figs. 18, 19). Ligament internal but externally visible. Lunule not well defined.

*Anatomy*: Inner and outer demibranchs, present. Transverse section of anterior adductor muscle larger than posterior muscle (other anatomical characters were not possible to study as specimens were dried).

#### Remarks

*Thyasira scotiana* closely resembles *Thyasira falklandica*, differing in having a more rounded shell outline, a flatter and thinner shell, and a shallower posterior sulcus. The shell outline and larger protoconch also distinguish *Thyasira scotiana* from other species known from the area.

*Thyasira debilis* (Thiele, 1912),  
new combination  
Figures 21–34

*Axinopsis debilis* Thiele, 1912: 232, pl. 18, fig. 25, 25a.

*Genaxinus debilis*: Dell, 1964: 208; Egorova, 1982: 70, figs. 314, 315; Dell, 1990: 57, figs. 93, 94.

*Genaxinus bongraini*: Nicol, 1966: 63 [in part], pl. 6, figs. 1, 2 [non Lamy, 1911].

*Thyasira bongraini*: Mühlenhardt Siegel, 1989: 162 [in part], pl. 13, fig. 24 [non Lamy, 1911].

#### Type Locality

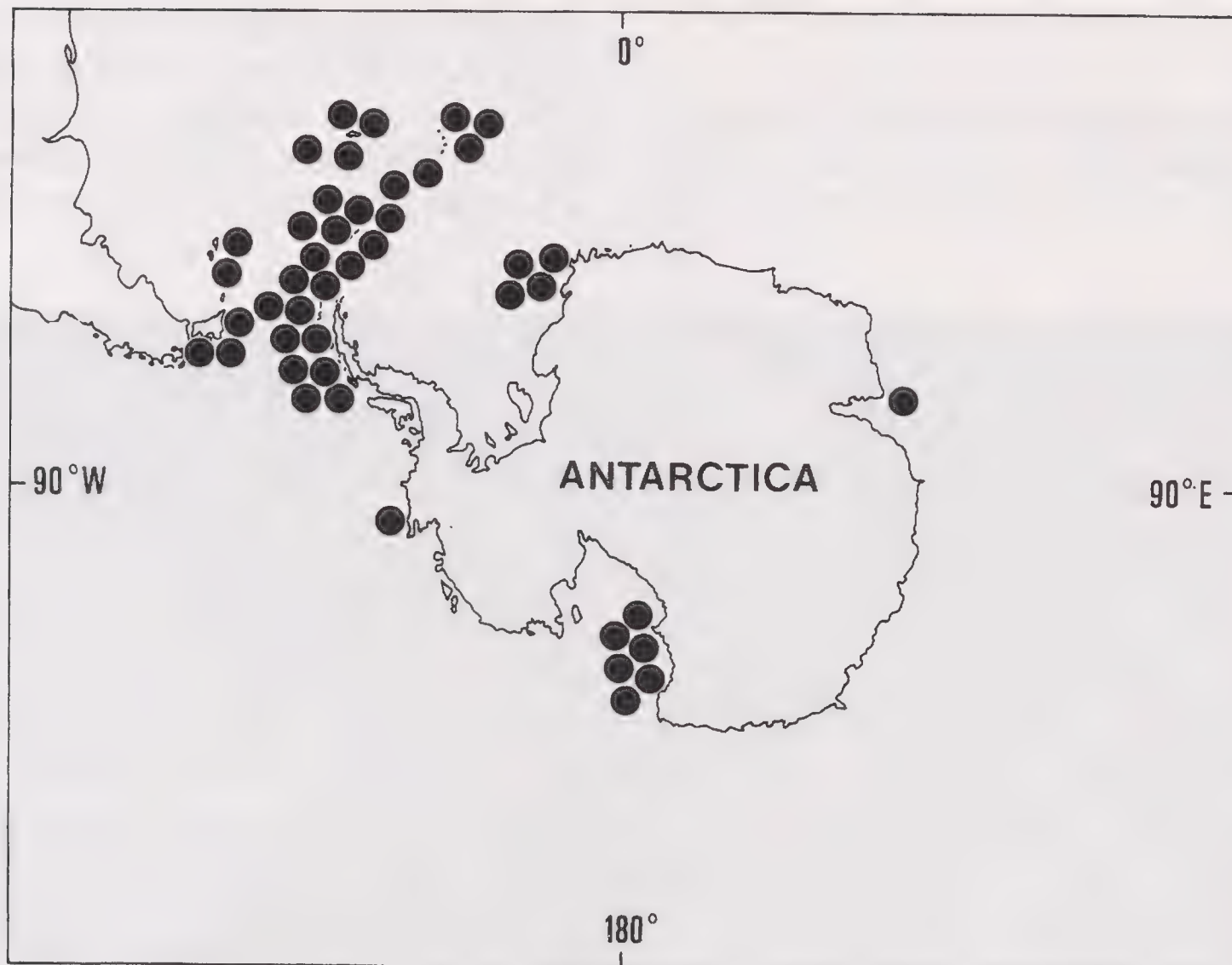
Gauss Station [66°S, 89°E, Davis Sea, Antarctica].

#### Material Examined (Fig. 21)

Holotype (ZMB 63112). Ross Sea: 77°27'S, 172°22'E, 752 m (3 sps & 4vs, NIWA 45844); 77°05'S, 177°12'E, 362 m (7 sps & 31 vs, NIWA 45845); 76°42'S, 179°44'E, 318–472 m (1 sp, NIWA 45846); 74°30'S, 179°40'E, 238–301 m (13 sps & 33 vs, NIWA 45847); 77°30'S, 164°38'E, 256–260 m (2 sps, NIWA 45848); 77°50'S, 166°30'E, 377 m (2 sps & 6 vs, NIWA 45849). Bellingshausen Sea: 70°52'52"S, 98°26'07"W, 425 m (5 sps, MLP 12703). Weddell Sea: 71°07'30"S, 11°27'42"W (6 sps, ZSM 20013026); 71°12'24"S, 12°26'48"W (2 sps,

ZSM 20012843); 71°08'54"S, 13°12'48"W (4 sps, ZSM 20012835); 71°06'12"S, 12°50'27"W (1 sp, ZSM 20012831; 1 sp, ZSM 20012841). Antarctic Peninsula: 63°30'S, 54°15'W, 200 m (79 sps, ZMH 274; 120 sps, ZMH 275); 63°11'30"S, 58°47'00"W, 93 m (155 sps, ZMH 287; 76 sps, ZMH 302); 66°36'06"S, 68°41'54"W, 607 m (4 sps, ZMB 114673); 65°54'54"S, 66°52'18"W, 175 m (83 sps, ZMH 357; 70 sps, ZMH 358); 66°32'06"S, 68°30'06"W, 500 m (1 sp, ZMH 360); 65°04'30"S, 66°58'54"W, 269 m (2 sps, ZMH 994); 66°09'30"S, 67°19'00"W, 375 m (6 sps, ZMH 995); 66°39'18"S, 69°23'36"W, 344 m (10 sps, ZMH 996); 66°31'12"S, 68°25'18"W, 464 m (2 sps, ZMH 32961). South Shetland Islands: 61°23'27"S, 55°26'49"W, 285–288 m (581 sps, MLP 12704); 61°15'S, 55°00'W, 120 m (23 sps, ZMH 276); 62°51'S, 56°00'W, 133 m (28 sps, ZMH 277; 2 sps, ZMH 279; 98 sps, ZMH 280; 137 sps, ZMH 301); 60°53'S, 56°45'W, 485 m (45 sps, ZMH 281); 62°09'36"S, 58°21'00"W, 485 m (8 sps, ZMH 286); 62°05'18"S, 57°39'00"W, 265 m (90 sps, ZMH 282); 62°59'S, 57°05'W, 68 m (97 sps, ZMH 285); 61°13'48"S, 54°39'12"W, 280 m (377 sps, ZMH 306); 61°18'30"S, 54°40'18"W, 370 m (84 sps, ZMH 308; 45 sps, ZMH 309); 61°21'48"S, 56°00'36"W, 368 m (140 sps, ZMH 310; 202 sps, ZMH 311); 61°09'42"S, 56°10'18"W, 290 m (63 sps, ZMH 314); 61°12'42"S, 55°56'24"W, 134 m (15 sps, ZMH 317; 10 sps, ZMH 318; 274 sps, ZMH 319; 111 sps, ZMH 320); 61°09'00"S, 56°07'12"W, 208 m (61 sps, ZMH 321; 222 sps, ZMH 322); 61°03'54"S, 55°58'48"W, 262 m (190 sps, ZMH 323; 160 sps, ZMH 324); 60°57'06"S, 55°55'12"W, 246 m (4 sps, ZMH 327); 60°51'18"S, 55°45'36"W, 290 m (24 sps, ZMH 334); 60°50'54"S, 55°37'24"W, 242 m (13 sps, ZMH 336; 428 sps, ZMH 338); 61°00'18"S, 55°13'36"W, 195 m (24 sps, ZMH 342; 50 sps, ZMH 343; 45 sps, ZMH 344); 60°53'36"S, 55°46'06"W, 260 m (6 sps, ZMH 345; 61 sps, ZMH 346); 62°49'18"S, 60°13'30"W, 850 m (3 sps, ZMH 349); 63°43'00"S, 61°13'36"W, 180 m (56 sps, ZMH 351); 62°46'36"S, 60°54'48"W, 140 m (56 sps, ZMH 352); 63°16'48"S, 63°44'30"W, 340 m (21 sps, ZMH 354; 36 sps, ZMH 355); 61°00'42"S, 55°01'24"W, 247 m (102 sps, ZMH 980); 60°56'24"S, 55°40'00"W, 112 m (33 sps, ZMH 981; 11 sps, ZMH 982; 95 sps, ZMH 983; 99 sps, ZMH 984); 61°13'18"S, 55°42'48"W, 96 m (4 sps, ZMH 986); 62°49'30"S, 60°57'30"W, 184 m (67 sps, ZMH 988; 28 sps, ZMH 989; 4 sps ZMH 990; 28 sps, ZMH 991); 63°18'00"S, 63°42'48"W, 300 m (21 sps, ZMH 993);



FIG. 21. Known distribution of *Thyasira debilis*.

60°52'42"S, 55°44'54"W, 234 m (34 sps, ZMH 997); 60°53'42"S, 55°46'42"W, 320 m (9 sps, ZMH 998); 60°55'00"S, 55°23'48"W, 227 m (22 sps, ZMH 999; 29 sps, ZMH 1000); 62°49'30"S, 60°57'30"W, 184 m (117 sps, ZMH 32956); 61°13'42"S, 55°58'06"W, 146 m (62 sps & 4 vs, ZMB 114668); 61°18'54"S, 58°41'42"W, 491 m (1 sp & 1 v, ZMB 114671); 62°07'12"S, 60°22'48"W (1 sp, ZSM 20013213); 63°04'42"S, 57°31'36"W (4 sps, ZSM 20012832; 12 sps, ZSM 20012834; 1 sp., 20012838); 63°01'06"S, 61°09'06"W (2 sps, ZSM 20012839; 1 sp, ZSM 20012849; 5 sps, 20012842); 62°00'05"S, 60°19'19"W (1 sp, ZSM 20012844); 63°02'18"S, 59°10'24"W (1 sp, ZSM 20012836); 62°55'00"S, 57°39'30"W (9 sps, ZSM 20012829); 62°30'00"S, 56°55'48"W (12 sps, ZSM 20012830); 62°07'12"S, 60°22'48"W (2 sps, ZSM 20012833); King George Island [62°13'S, 58°40'W], 15–150 m (77 sps, ZMH 288; 5 sps, ZMH 304; 30 sps, ZMH 305); Fildes Strait [62°14'S, 59°00'W], 15–20 m (1 sp, ZMB 114661); Maxwell Bay [62°10–19'S, 58°35–58'W], 20–100 m (4 sps, ZMB 116662; 11 sps, ZMB 116663; 3 sps, ZMB 116665). South Orkney Islands: 61°10'49"S, 45°42'43"W, 322 m (44 sps, MLP 12705); 60°34'54"S, 44°17'00"W, 240 m (21 sps, ZMH 289); 60°51'18"S, 44°12'00"W, 178 m (48 sps, ZMH 290); 60°47'12"S, 45°44'24"W, 237 m (96

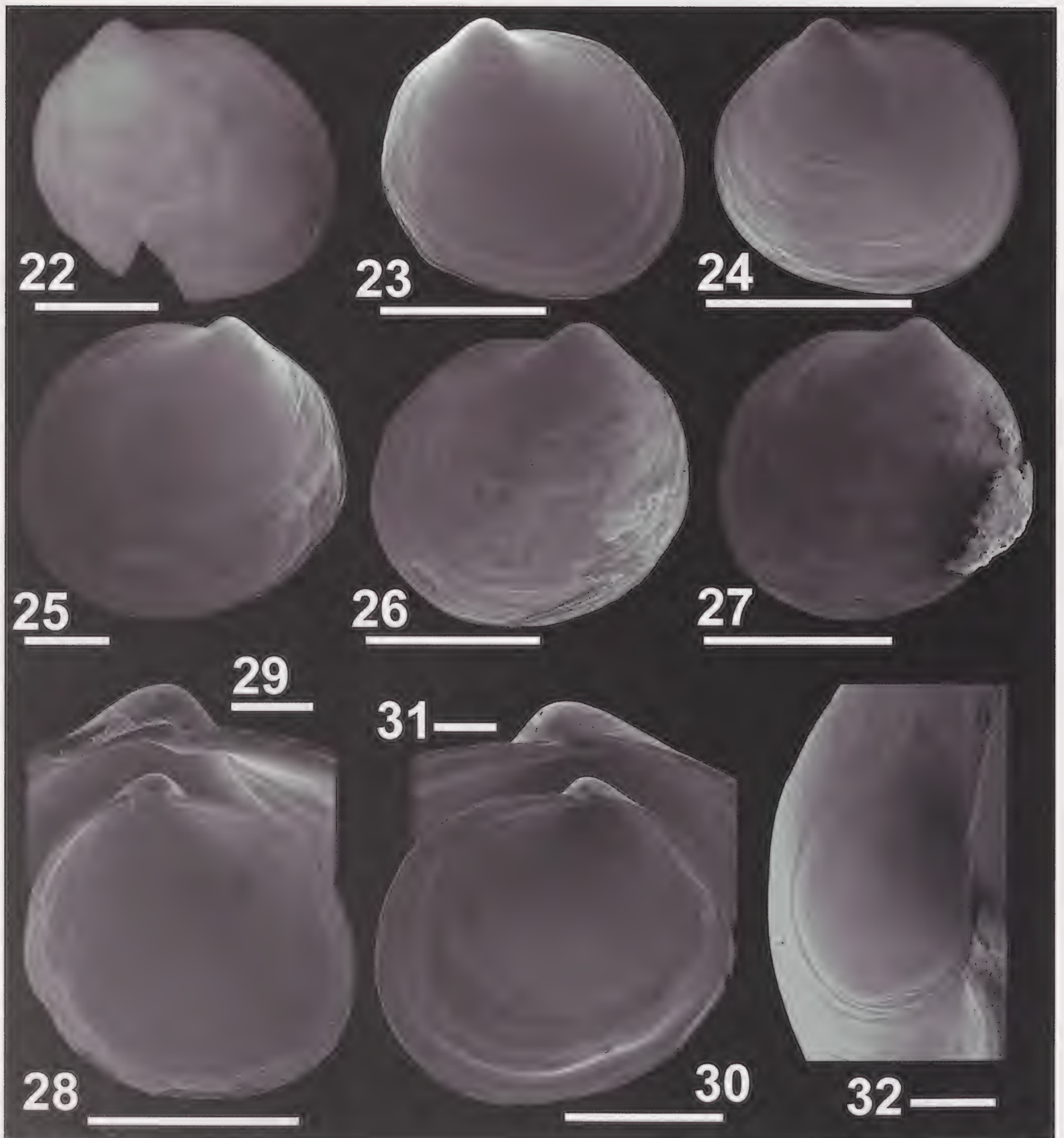
sps, ZMH 292); 61°03'12"S, 45°24'36"W, 248 m (13 sps, ZMH 293); 61°07'30"S, 46°31'30"W, 289 m (59 sps, ZMH 294); 60°55'00"S, 46°47'48"W, 320 m (63 sps, ZMH 295); 60°25'06"S, 45°39'30"W, 285 m (28 sps, ZMH 296); 60°23'06"S, 46°20'24"W, 265 m (144 sps, ZMH 297); 60°23'06"S, 46°44'00"W, 280 m (60 sps, ZMH 298; 13 sps, ZMH 299). South Sandwich Islands: 57°40'33"S, 26°25'08"W, 278–308 m (11 sps, MLP 12706); 59°54'58"S, 32°28'19"W, 518–521 m (13 sps & 2 vs, MLP 12707); 57°40'21"S, 26°27'53"W, 475–587 m (2 sps, MLP 12708); 57°40'46"S, 26°24'54"W, 263–270 m (1 sp, MLP 12709). South Georgia Islands: 54°27'S, 35°40'W, 236–239 m (14 sps & 1 v, MLP 12710); 54°27'S, 35°41'W, 249–256 m (24 sps, MLP 12711); 54°30'S, 35°50'W, 94 m (17 sps, MLP 12711). Shag Rocks: 53°23'48"S, 42°42'01"W, 313 m (1 sp & 1 v, MLP 12713). Burdwood Bank: 54°30'13"S, 56°08'12"W, 286–290 m (7 sps & 6 vs, MLP 12714); 54°01'21"S, 62°01'19"W, 272 m (1 v, MLP 12702). Beagle Channel: 54°53'06"S, 69°30'30"W, 62 m (2 sps, ZMH 33047); 54°56'00"S, 69°14'18"W, 208 m (1 sp & 1 v, ZMH 19764). Strait of Magellan: 53°28'48"S, 70°21'54"W, 92 m (7 sps, ZMH 19757). Drake Passage: 55°28'48"S, 66°03'24"W, 1,279 m (42 sps, ZMB 103642); 55°27'24"S, 66°06'18"W, 780 m (1 sp, ZMB 103687).



## Description

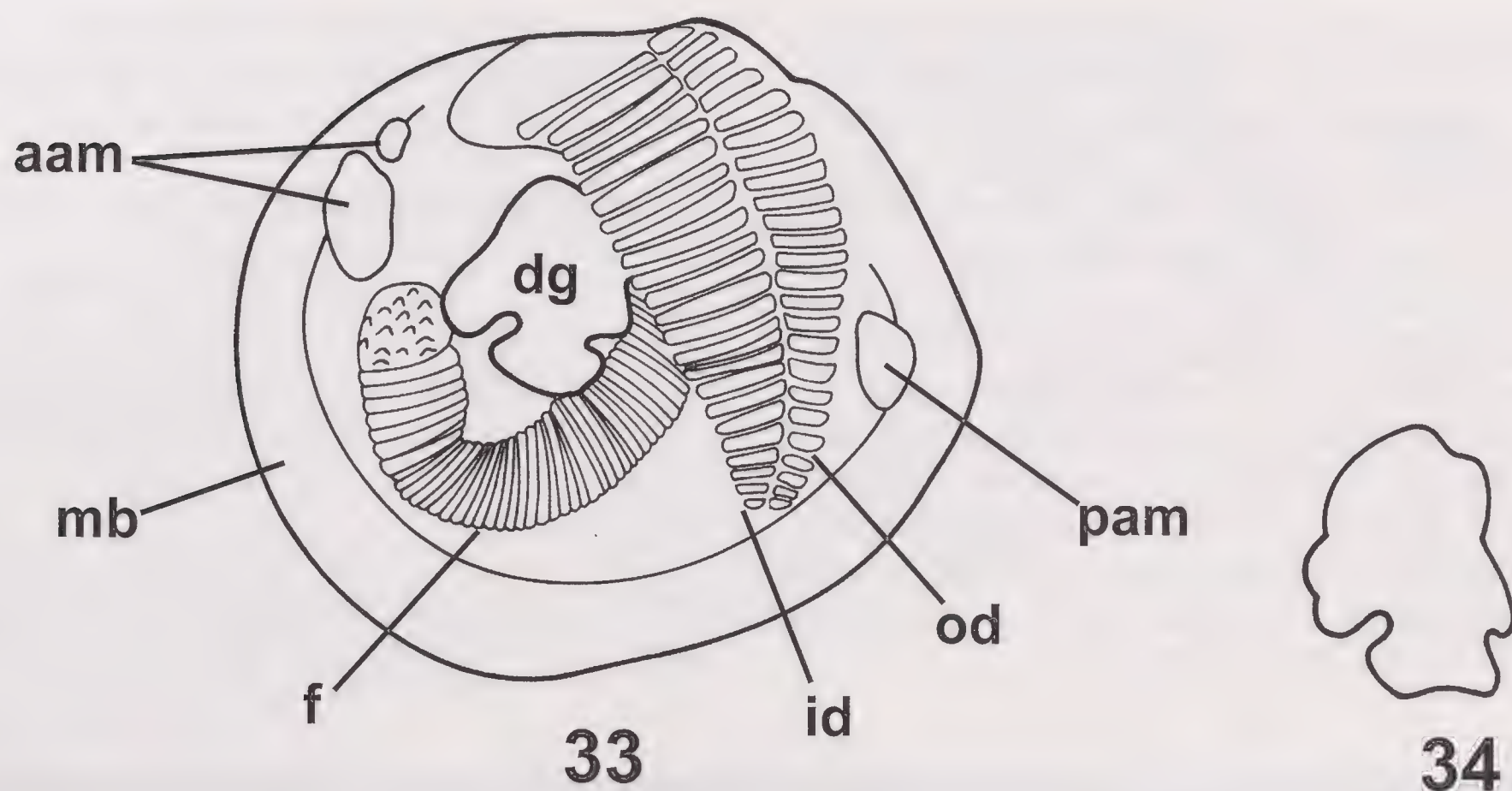
Shell small (maximum observed H = 2.3 mm), subovate, inflated (W/H =  $0.66 \pm 0.04$ , n = 24), delicate, inequilateral. Anterior end widely

projecting; posterior end short, angulated (Figs. 22–27). Anterior and posterior ends frequently incrustated with ferruginous material. Anterior part of dorsal margin nearly straight, horizontal to slightly sloping downwards, forming slight



FIGS. 22–32. *Thyasira debilis*. FIG. 22: Holotype (ZMB 63112); FIG. 23: Specimen from 59°54'58"S, 32°28'19"W, 518–521 m (MLP 12707); FIG. 24: Specimen from 54°30'S, 35°50'W, 94 m (MLP 12711); FIGS. 25, 28, 29: Specimens from 70°52'52"S, 98°26'07"W, 425 m (MLP 12703); FIGS. 26, 27, 30, 31: Specimens from 61°23'27"S, 55°26'49"W, 285–288 m (MLP 12704); FIG. 32: Specimen from 55°28'48"S, 66°03'24"W (ZMB 103642); FIGS. 22–24: Outer view right valve; FIGS. 25–27: Outer view left valve. FIGS. 28, 29. Inner view left valve. FIG. 28: General view; FIG. 29: Detail of hinge; FIGS. 30, 31. Inner view right valve. FIG. 30: General view; FIG. 31: Detail of hinge; FIG. 32: Protoconch. Scale bars FIGS. 22–24, 26–28, 30 = 1 mm; FIGS. 25, 29, 31 = 200 μm; FIG. 32 = 50 μm.





FIGS. 33, 34. *Thyasira debilis*. FIG. 33: Anatomy of a decalcified specimen; FIG. 34: Detail of digestive gland. aam: anterior adductor muscle; dg: digestive gland; f: foot; id: inner demibranch; mb: mantle border; od: outer demibranch; pam: posterior adductor muscle.

angle with anterior margin (Figs. 27, 28, 30). Anterior margin widely curved; ventral margin evenly rounded (Figs. 22–27). Posterior part of dorsal margin sloping rapidly and nearly straight from beak. Posterior area of shell poorly discernible from central area. Primary sulcus only defined by slightly flattening in posterior margin; auricle variably projecting (Figs. 22–27). First and second posterior folds obsolete. Lunule ill defined. Beaks small, full, posteriorly located. Protoconch ovate, of about 135  $\mu\text{m}$  in diameter, smooth (Fig. 32). Shell surface whitish, brilliant, sculptured with low growth lines. Periostracum thin, cream. Hinge plate narrow, with variably developed anterior pseudocardinal tubercle in right valve, and corresponding depression in left valve (Figs. 28–30). Ligament short, located into posterior ligamental groove, not visible externally.

**Anatomy:** Mantle margin wide, largely free for about 3/4 of its length. Only one siphonal opening present; presiphonal suture short. Transverse section of anterior adductor muscle large, formed by 2–3 well-defined areas; transverse section of posterior adductor muscle small, about one-third anterior muscle (Fig. 33). Both inner and outer demibranchs, present, formed by 25–32 filaments in adult specimens; outer demibranch about half height of inner one. Ascending and descending lamellae of inner demibranch equally developed; descending lamella of outer demibranch very short, approximately 1/6 high of

ascending lamella. Labial palp smooth. Digestive gland small, forming three main lobes: anterior slightly trilobed, ventral bilobed, and posterior of undulating outline (Fig. 34). Foot long, stout, vermiform at stem, with well-separated distal bulb differentiated into two main areas: proximal with corrugated surface (as foot stem) and distal with warts (Fig. 33). Heel not demarked.

#### Remarks

*Thyasira debilis* has frequently been confused in the literature with *Axinus bongraini*. Nicol (1966) first reported *T. debilis* in the synonymy of *Axinus bongraini* (as *Genaxinus*), a conclusion subsequently followed by Hain (1990). Dell (1990) also inferred that “the single specimen of a thyasirid which Lamy described as *bongraini* from off the Antarctic Peninsula should represent the only common thyasirid known from this area, i.e. “*debilis*””. *Axinus bongraini* is here regarded as a *nomen dubium*; however, the original description by Lamy (1911a) and the redescription and figure the author subsequently provided (Lamy, 1911b) show that *Axinus bongraini* clearly differs from *Thyasira debilis* in having a high shell, with triangular shell outline, a long anterior part of dorsal margin which slopes downwards quickly, and a widely rounded ventral margin. These differences clearly preclude these species from being synonyms.

It should be noted that Dell’s (1990) report of *Thyasira debilis* as the only thyasirid occurring in



the vicinity of the Antarctic Peninsula, is incorrect. In this area also occurs *Parathyasira dearborni*. These two species are clearly different: *P. dearborni* is characterized by a rhomboidal, higher than long shell outline, with subcentrally located beaks, and edentulous hinge, while *T. debilis* has a subovate, longer than high shell outline, posterior beaks, and hinge with a pseudocardinal tubercle. The morphological characters described above also allow the separation of *Thyasira debilis* from any other thyasirid species occurring in the area. Anatomically, this species is characterized by having a small digestive gland, and extremely short ascending lamellae in the outer demibranch.

*Parathyasira* Iredale, 1930

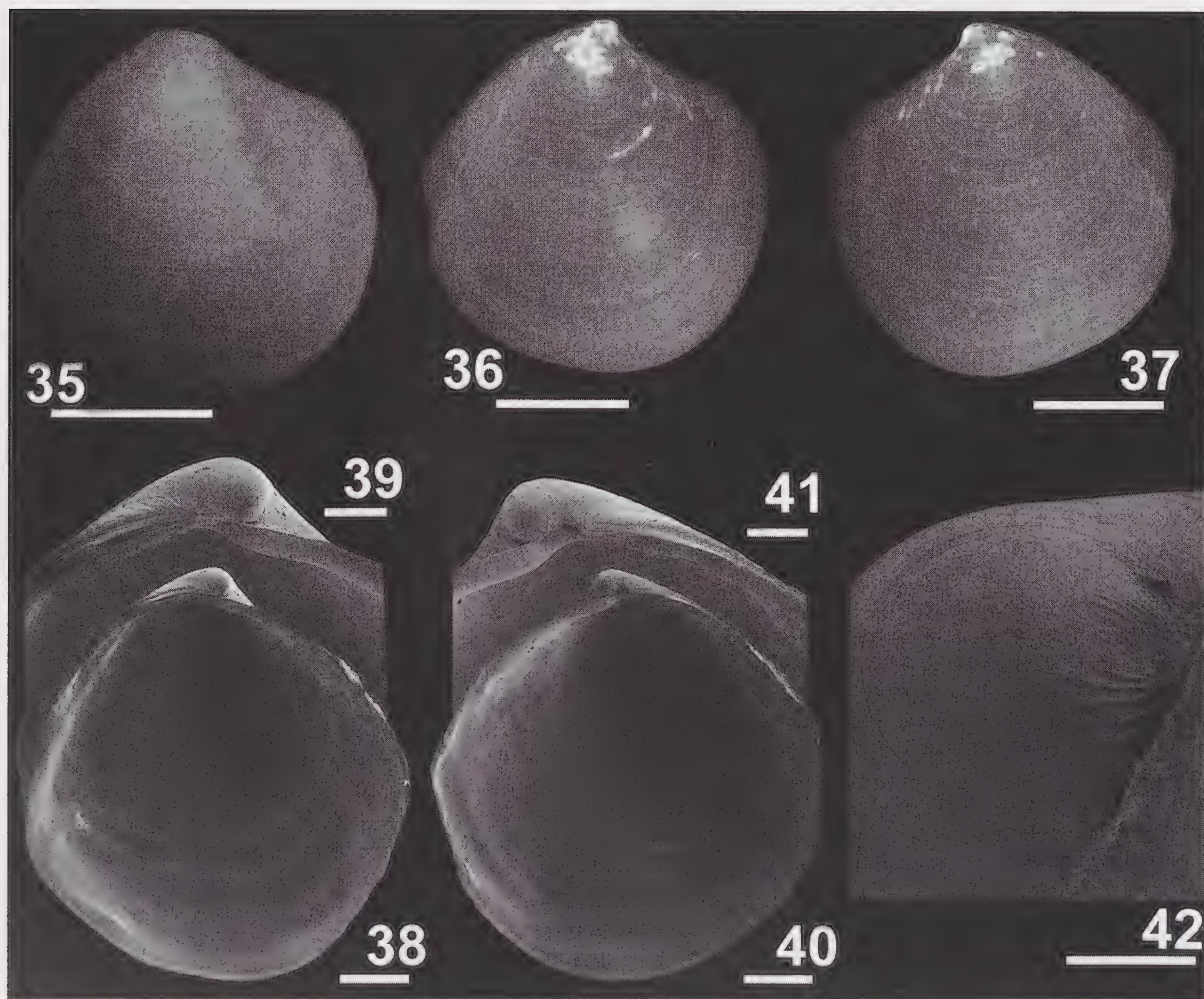
Type Species: *Parathyasira resupina* Iredale, 1930 (by original designation)

*Parathyasira magellanica* (Dall, 1901),  
new combination  
Figures 1, 35–45

*Thyasira magellanica* Dall, 1901: 819, pl. 42,  
fig. 6; Carcelles, 1950: 78, pl. 4, fig. 77.

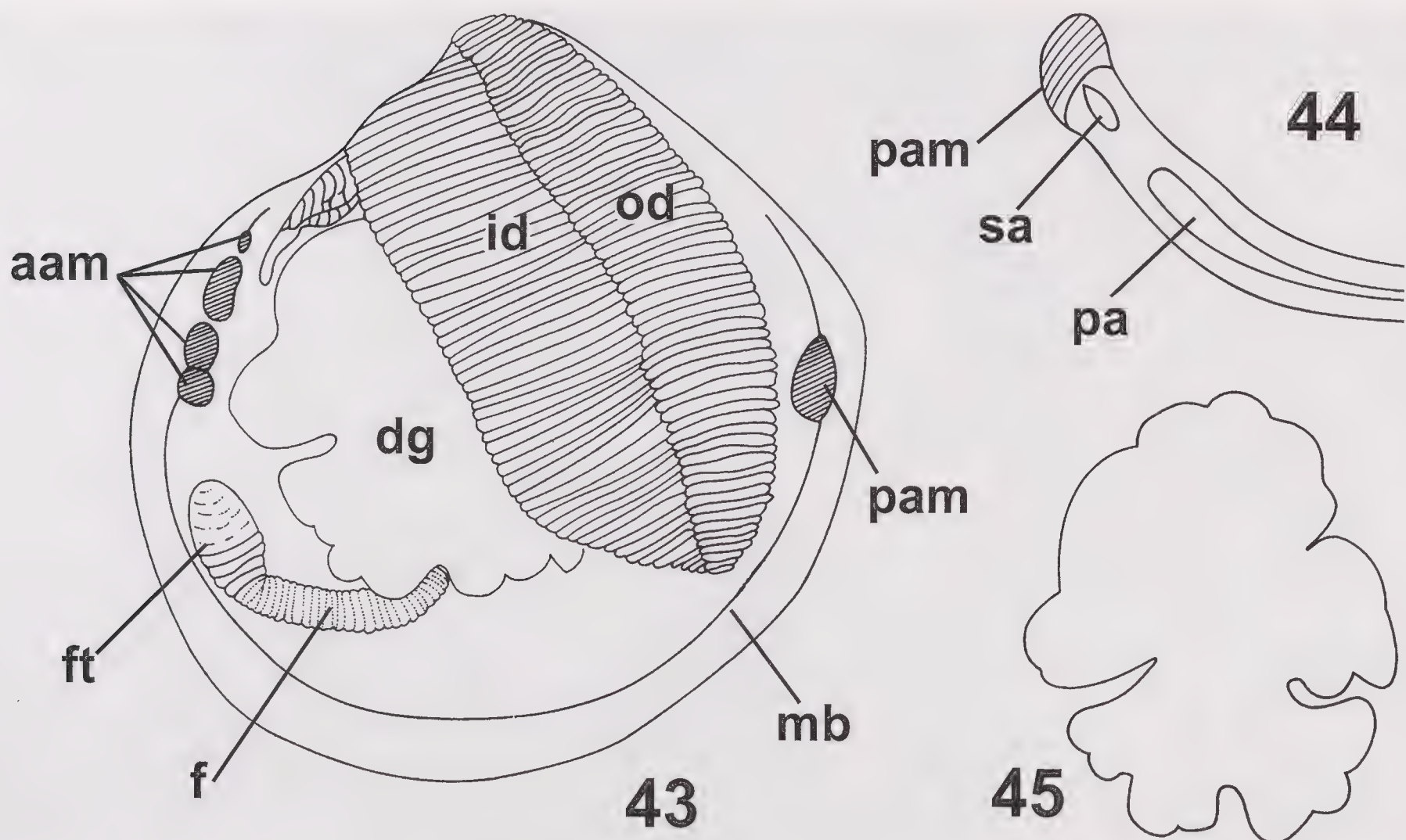
Type Locality

West coast of Patagonia, 194 fathoms  
[355 m].



FIGS. 35–42. *Parathyasira magellanica*. FIG. 35: Holotype (USNM 122745); FIGS. 36, 37, 42: Specimens from 54°55'24"S, 69°19'48"W, 272 m (ZMH 19762); FIGS. 38–41: Specimen from 54°49'S, 68°14'W, 126–135 m (MLP 12969); FIGS. 35, 36: Outer view right valve; FIG. 37: Outer view left valve; FIGS. 38, 39: Inner view left valve. FIG. 38: General view; FIG. 39: Detail of hinge; FIGS. 40, 41: Inner view, right valve. FIG. 40: General view; FIG. 41: Detail of hinge; FIG. 42: Protoconch. Scale bars FIGS. 35–37 = 2 mm; FIGS. 38, 40 = 500  $\mu$ m; FIGS. 39, 41 = 200  $\mu$ m; FIG. 42 = 50  $\mu$ m.





FIGS. 43–45. *Parathyasira magellanica*. FIG. 43: Anatomy of a decalcified specimen; FIG. 44: Detail of posterior part of mantle margin; FIG. 45: Detail of digestive gland. aam: anterior adductor muscle; dg: digestive gland; f: foot; ft: foot tip; id: inner demibranch; mb: mantle border; od: outer demibranch; pa: pedal aperture; pam: posterior adductor muscle; sa: siphonal aperture.

#### Material Examined (Fig. 1)

Holotype (USNM 122745). Beagle Channel: 54°53'06"S, 69°30'30"W, 62 m (3 sps, ZMH 19760); 54°55'24"S, 69°19'48"W, 272 m (1 sp, ZMH 19761; 8 sps & 1 v, ZMH 19762; 5 sps & 1 v, ZMH 19763); 54°54'54"S, 68°39'06"W, 310 m (1 sp, ZMH 19765); 54°49'S, 68°14'W, 126–135 m (1 sp, MLP 12969); 54°49'S, 68°13'W, 138–144 m (1 sp, MLP 12697). Magellan Strait: 53°43'18"S, 70°56'06"W, 335 m (1 sp & 4 vs, ZMH 19754); 53°42'48"S, 70°57'30"W, 51 m (2 sps, ZMH 19755); 53°32'54"S, 70°39'12"W, 462 m (2 sps, ZMH 19758); 53°42'42"S, 70°50'06"W, 522 m (3 sps, ZMH 19759).

#### Description

Shell medium in size (maximum observed  $H = 7.5$  mm), subquadrate, approximately equilateral, somewhat inflated ( $W/H = 0.57 \pm 0.05$ ,  $n = 15$ ), delicate, translucent. Anterior end slightly horizontally projecting (Figs. 35–37). Anterior part of dorsal margin sloping downwards gradually, almost straight, with marked angle at junction with anterior margin, which is almost vertical, evenly rounded or angled (Figs. 35–38, 40). Ventral margin markedly curved, somewhat

anteriorly expanded, insensibly connected with anterior margin. Posterior area of shell clearly distinguished from central area (Figs. 36, 37). First posterior fold absent; second posterior fold low, rounded. Posterior sulcus narrow, shallow, resulting in a flat or weakly sinuate posterior margin (Figs. 35–38, 40). Auricle absent. Submarginal sulcus long, deeply incised, almost vertical. Lunule small, narrow. Beaks pointed, subcentrally located, anteriorly directed. Protoconch outline ovate, about 120  $\mu$ m in diameter; initial part sculptured with 5–7 lamellated folds, sometimes bifurcated at base, symmetrically distributed with respect to main central axis (Fig. 42). Shell surface shiny, with fine, low growth lines, increasing in solidness towards ventral margin. Periostracum thin, translucent. Hinge plate narrow, edentulous, with narrow posterior ligamental groove (Figs. 38–40); ligament internal, externally visible, representing one-half submarginal sulcus length.

*Anatomy:* Mantle margin largely free, for about 3/4 of its length. Small (exhalant) posterior aperture present; presiphonal suture short (Fig. 44). Transverse section of anterior adductor muscle elongated, showing in larger specimens usually four well-defined areas; transverse section of



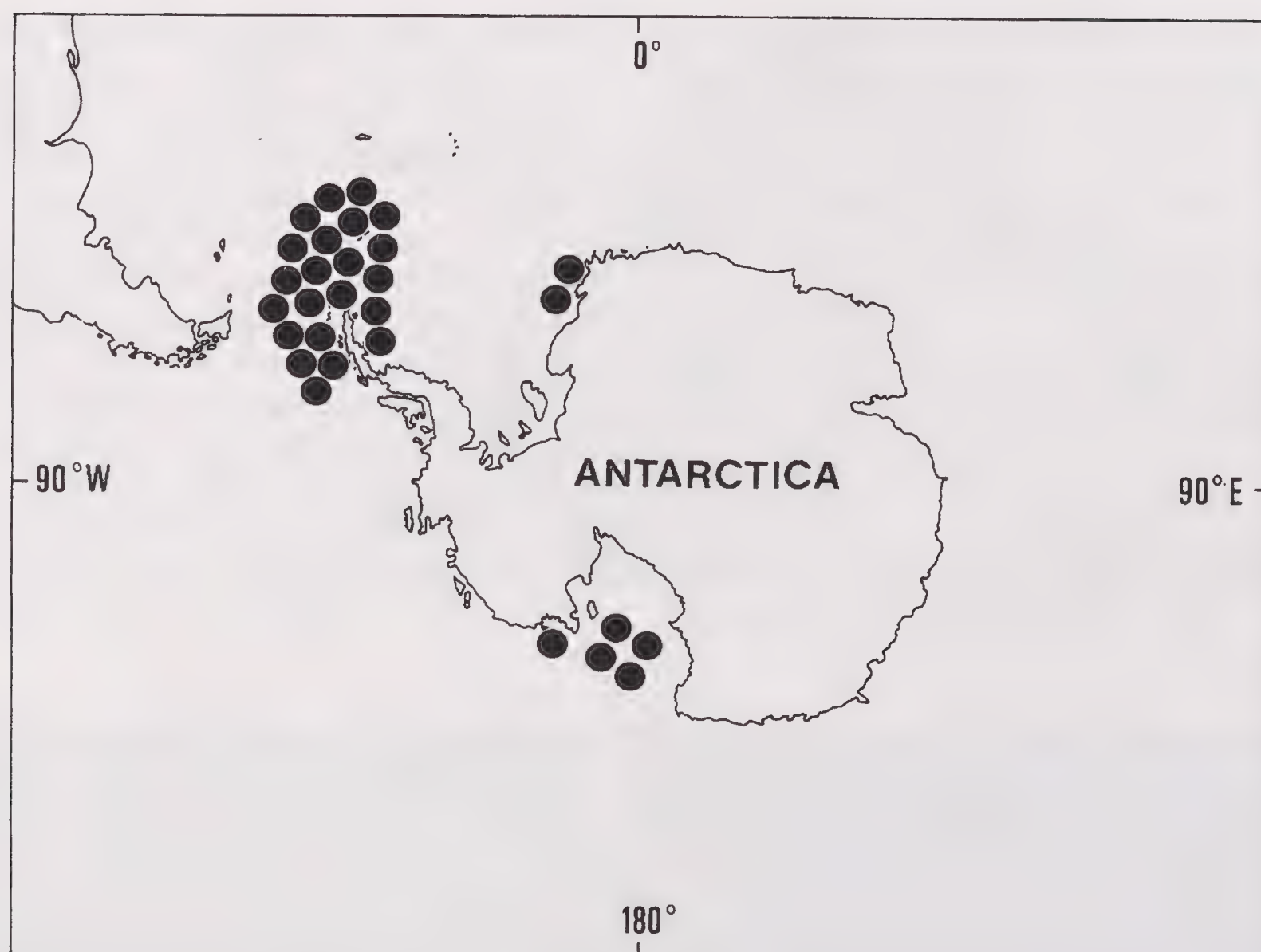


FIG. 46. Known distribution of *Parathyasira dearborni*.

posterior adductor muscle ovate, much smaller than anterior one (Fig. 43). Gills: both inner and outer demibranchs, formed by 55–65 filaments in adult specimens present; outer demibranch about half high of inner (Fig. 43). Ascending and descending lamellae of inner demibranch similar in size; descending lamella of outer demibranch one-half length of ascending lamella. Labial palp with 3–4 prominent sorting ridges. Digestive gland with four main lobes: large anterior auricular lobe, two ventral lobes, and small posterior lobe (Fig. 45). Foot vermiform, corrugated at stem and base of bulbous tip; distal bulbous tip with wart-like surface (Fig. 43); heel not demarcated.

#### Remarks

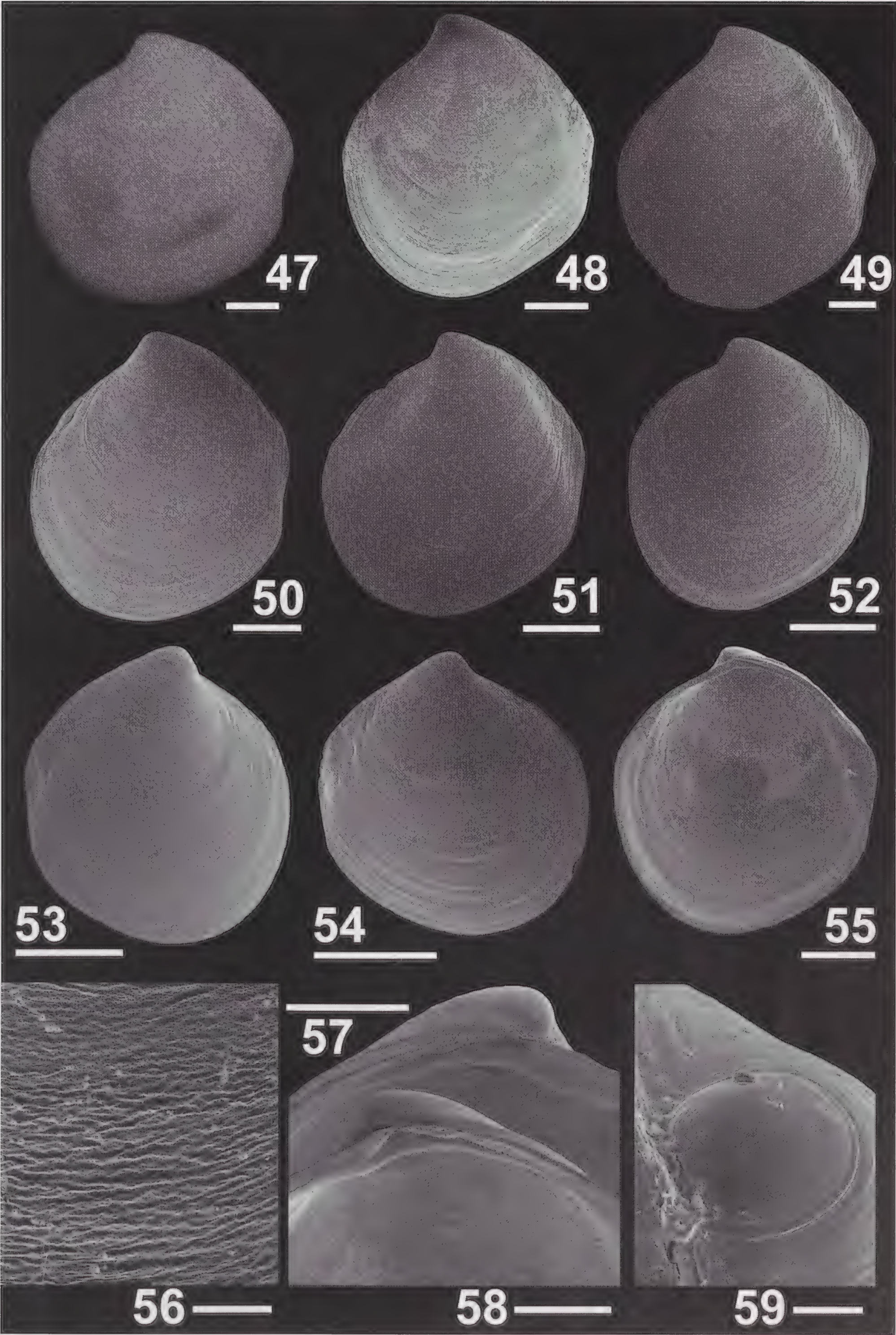
*Parathyasira magellanica* closely resembles *Parathyasira dearborni*, from which it may be separated by the shorter anterior end, projecting horizontally (instead of obliquely); these charac-

teristics result in a wider and proportionally lower shell outline. These species also differ in anatomy: *P. magellanica* has only one siphonal opening instead of two as in *P. dearborni*. Oliver & Sellanes (2005) suggested that *Parathyasira magellanica* may be a juvenile of *Thyasira falklandica*. This opinion is not shared in the present study: *T. falklandica* has a larger and more elongated shell, the anterior end more markedly pointed, and the beaks lower and more rounded. Furthermore, *P. magellanica* has a less solid shell.

Soot Ryen (1951) pointed on the similarities of *Parathyasira magellanica* and *Thyasira* (?) *bongraini*, suggesting that both names may be synonyms. However, the figure of *T. bongraini* by Lamy (1911b), reproduced here as Figure 68, shows a longer anterior part of dorsal margin, sloping downwards more abruptly than in *P. magellanica*, and the anterior margin forming a wide curve with the ventral margin. In the present study, *T. bongraini* is regarded as a *nomen dubium*.

→  
FIGS. 47–59. *Parathyasira dearborni*. FIG. 47: Holotype (USNM 653099); FIG. 48: Specimen from 62°49'30"S, 60°57'30"W, 184 m (ZMH 33053); FIG. 49: Specimen from 77°05'S, 177°12'E (NIWA 45842); FIGS. 50, 56: Specimen from 74°46'24"S, 178°23'24"W (NHM 1964752); FIG. 51: Specimen from 77°27'S, 172°22'E (NIWA 45841); FIG. 52: Specimen from 64°50'35"S, 62°57'55"W (MLP 12699); FIGS. 53–55, 57–59: Specimens from 60°59'11"S, 43°27'25"W (MLP 12701); FIGS. 47–52: Outer view left valve; FIGS. 53, 54: Outer view right valve; FIG. 55: Inner view right valve; FIG. 56: Detail of shell sculpture; FIGS. 57, 58: Detail of hinge. FIG. 57: Left valve; FIG. 58: Right valve; FIG. 59: Protoconch. Scale bars FIGS. 47–55 = 1 mm; FIG. 56 = 100 µm; FIGS. 57, 58 = 500 µm; FIG. 59 = 50 µm.







*Parathyasira dearborni* (Nicol, 1965),  
new combination  
Figures 46–62

*Thyasira bongraini*: Mühlenhardt Siegel, 1989: 162 [in part], pl. 3, fig. 24 (*non* Lamy, 1911).

*Thyasira cf. bongraini*: Dell, 1964: 207, fig. 4, # 10, 11.

*Thyasira dearborni* Nicol, 1965: 79, pl. 8, figs. 1, 2; Dell, 1990: 56, figs. 91, 92.

#### Type Locality

73°46.7'S, 169°09'E, off Coulman Island [Ross Sea], 836 m.

#### Material Examined (Fig. 46)

Holotype (USNM 653099). Ross Sea: 74°46'24"S, 178°23'24"W, 351 m (2 sps & 2 vs, NHM 1964752); 77°27'S, 172°22'E, 752 m (4vs, NIWA 45841); 75°17'S, 172°20'E, 534–549 m (2 sps, NIWA 45843); 77°05'S, 177°12'E, 362 m (4 vs, NIWA 45842). Antarctic Peninsula: 63°04'42"S, 57°31'36"W (6 sps, ZSM 20012849); 64°50'35"S, 62°57'55"W, 294 m (1 sp, MLP 12699); 63°11'30"S, 58°47'00"W, 93 m (11 sps, ZMH 32975); 66°31'12"S, 68°25'18"W, 464 m (7 sps, ZMH 32960); 65°23'36"S, 66°10'06"W, 420 m (13 sps, ZMH 356); 66°32'06"S, 68°30'06"W, 500 m (4 sps, ZMH 361); 67°16'06"S, 69°21'36"W, 420 m (4 sps, ZMH 362; 5 sps, ZMH 363). Weddell Sea: 71°06'16"S, 12°50'28"W (1 sps, ZSM 20012850); 70°50'36"S, 10°35'24"W (1 sps, ZSM 20012852). South Shetland Islands: 62°07'12"S, 60°22'48"W (2 sps, ZSM 20012850); 61°15'00"S, 55°00'00"W, 120 m (2 sps, ZMH 32974); 62°05'18"S, 57°39'00"W, 265 m (8 sps, ZMH 32963; 5 sps, ZMH 283); 62°59'S, 57°05'W, 68 m (1 sp, ZMH 32965); 62°49'30"S, 60°57'30"W, 184 m (8 sps, ZMH 32957; 2 sps, ZMH 32958); 64°07'36"S, 65°13'06"W, 546 m (1 sp, ZMH 32959); 61°01'18"S, 56°00'24"W, 339 m (2 sps, ZMH 32962); 61°00'42"S, 55°02'24"W, 247 m (3 sps, ZMH 1001); 62°49'30"S, 60°57'30"W, 184 m (1 sp, ZMH 32983; 4 sps, ZMH 32984); 60°57'06"S, 55°55'12"W, 246 m (1 sp, ZMH 329); 61°15'00"S, 55°00'00"W, 120 m (2 sps, ZMH 300); 61°13'48"S, 54°39'12"W, 280 m (1 sp, ZMH 32976; 11 sps, ZMH 32977); 61°03'54"S, 55°58'48"W, 262 m (1 sp, ZMH 32978); 62°46'36"S, 60°54'48"W, 140 m (2 sps, ZMH 32980); 63°16'48"S, 63°44'30"W, 354 m (3 sps, ZMH 32981; 33 sps, ZMH 32982);

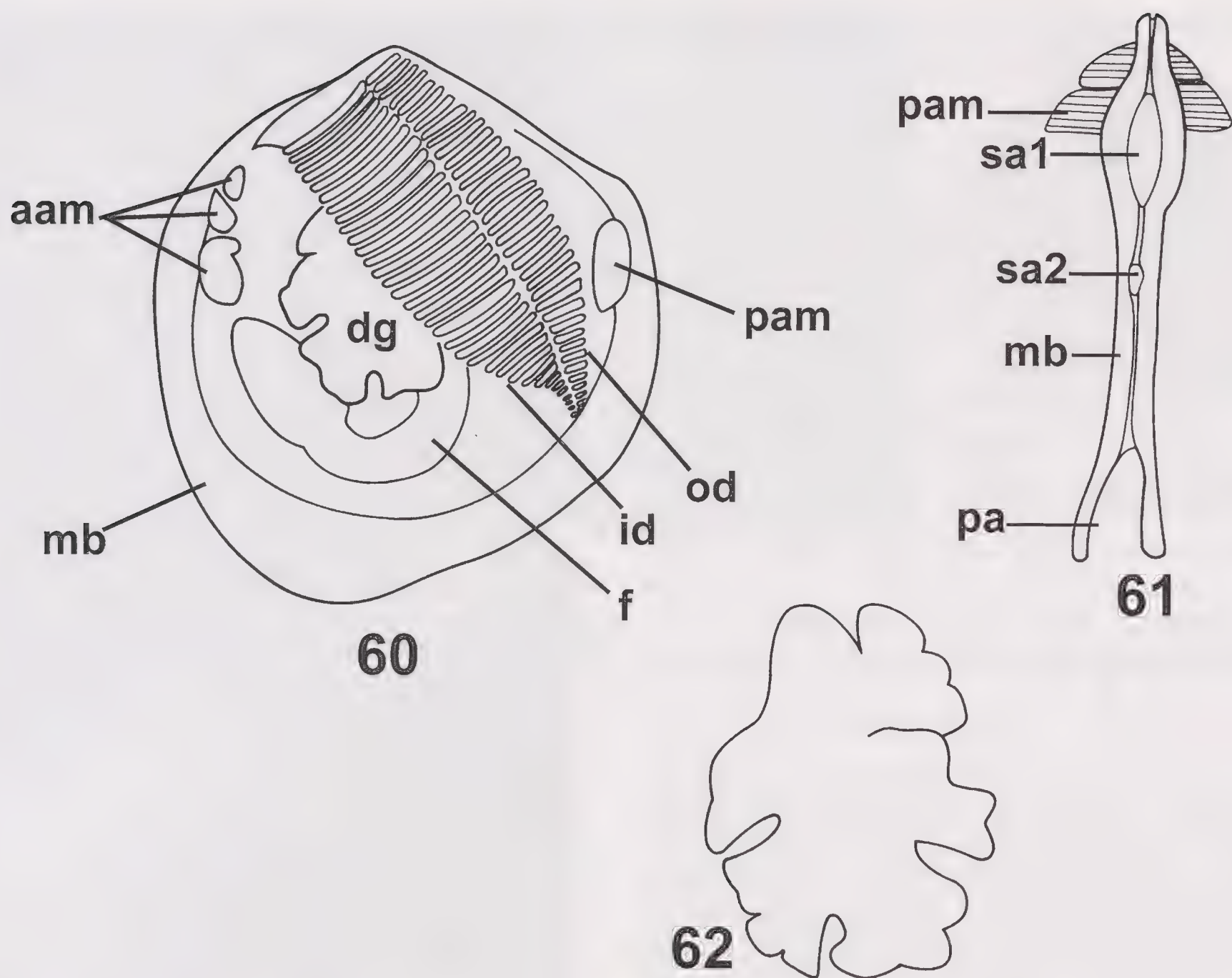
62°49'30"S, 60°57'30"W, 184 m (9 sps, ZMH 32986); 62°49'30"S, 60°57'30"W, 184 m (2 sps, ZMH 33053; 5 sps, ZMH 33054); 64°07'36"S, 65°13'06"W, 546 m (3 sps, ZMH 33055); 62°18'54"S, 58°41'42"W, 491 m (1 sp & 1 v, ZMB 114672); Maxwell Bay, King George Island [62°10–19'S, 58°35–58' W] (5 sps, ZMH 303; 1 sp, ZMB 114664; 1 sp, ZMB 114667). South Orkney Islands: 61°10'48"S, 45°42'43"W, 322 m (1 v, MLP 12700); 60°59'11"S, 43°27'25"W, 402 m (82 sps, MLP 12701); 60°46'36"S, 45°21'54"W, 127 m (6 sps, ZMH 291); 60°51'18"W, 44°12'00"W, 178 m (3 sps, ZMH 32967); 60°47'12"S, 45°44'24"W, 237 m (9 sps, ZMH 32968); 61°07'30"S, 46°31'30"W, 289 m (12 sps, ZMH 32969); 60°55'00"S, 46°46'48"W, 320 m (1 sp, ZMH 32970); 60°25'06"S, 45°39'30"W, 285 m (3 sps, ZMH 32971); 60°23'06"S, 46°20'24"W, 265 m (10 sps, ZMH 32972); 60°23'06"S, 46°40'00"W, 280 m (4 sps, ZMH 32973).

#### Description

Shell medium in size (maximum H = 6 mm), inflated (W/H =  $0.63 \pm 0.03$ ,  $n = 17$ ); anterior end obliquely projecting, particularly in large specimens, resulting in markedly rhomboidal outline (Figs. 47–55). Anterior part of dorsal margin long nearly straight, sloping downwards abruptly, forming weak angle with anterior margin. Anterior margin widely curved, continuous with anterior part of ventral margin; posterior part of ventral margin tending to be parallel to anterior part of dorsal margin (Figs. 47–55). Posterior area of shell flat or with very shallow sinus (Figs. 47–55). Auricle and first posterior fold absent; second posterior fold rounded and weak. Submarginal sulcus long, deeply incised, with almost vertical margins. Beaks rounded, inflated, subcentrally located, anteriorly directed. Protoconch ovate, about 115  $\mu$ m diameter, initial part sculptured with 14 strong folds, bifurcated at base, symmetrically distributed with respect to main central axis (Fig. 59). Lunule not well defined. Shell surface whitish, dull, sculptured with commarginal ribs composed by microscopic irregular corrugations and pustules (Fig. 56). Periostracum thin, translucent. Ferruginous material sometimes incrusting anterior and posteriorly. Hinge plate narrow, edentulous, with narrow posterior ligamental groove (Figs. 57, 58). Ligament half length of submarginal sulcus, internal but externally visible.

*Anatomy*: Mantle margin free anteriorly, with long posterior presiphonal suture (1/3





FIGS. 60–62. *Parathyasira dearborni*. FIG. 60: Anatomy of a decalcified specimen; FIG. 61: Detail of posterior part of mantle margin; FIG. 62: Detail of digestive gland. aam: anterior adductor muscle; dg: digestive gland; f: foot; id: inner demibranch; mb: mantle border; od: outer demibranch; pa: pedal aperture; pam: posterior adductor muscle; sa1, sa2: siphonal apertures.

of total mantle margin length), and two small posterior openings (Fig. 61). Mantle margin greatly thickened along pedal aperture. Section of anterior adductor muscle long, formed by three well-differentiated areas in adult specimens, narrowing dorsally. Transverse section of posterior adductor muscle ovate, one-third anterior muscle (Fig. 60). Inner and outer demibranchs present, comprising 43–50 filaments in adult specimens; outer demibranch about one-half height of inner demibranch (Fig. 60). Ascending and descending lamellae of inner demibranch similar in size; descending lamellae of outer demibranch one-half length of ascending demibranch. Labial palp with prominent sorting ridges. Foot long, slender, vermiform at stem, bearing sharp tip (Fig. 60); heel not demarked. Digestive gland with five main lobes: large, auriculiform anterodorsal lobe with central depression, two ventral lobes, and two posterior lobes; ventral and posterior lobes smaller than anterior lobe, with shallow, rounded subdivisions (Fig. 62).

#### Remarks

*Parathyasira dearborni* resembles *P. magellanica*. However, both species are easily separated based on shell morphology and anatomy. In *Parathyasira dearborni* the anterior part of dorsal margin is longer, sloping downwards more abruptly, and straighter than in *P. magellanica*, and the anterior end more obliquely projecting, resulting in a higher shell with a more rhomboidal shell outline. On the other hand, *P. magellanica* has subquadrate shell, and the anterior end is not obliquely projecting. In addition, while *P. bongraini* has two siphonal openings, *P. magellanica* has only one.

Mühlenhard Siegel (1989) reported as *Thyasira bongraini* specimens from South Shetland Islands, South Orkney Islands, and the Antarctic Peninsula; the re-examination of this material (ZMH) showed that some of these records correspond to *T. dearborni*. Re-examination of the specimens from the Ross Sea reported by Dell (1964) as *Thyasira cf. bongraini* (NHM 1964752) reveals that they actually correspond to *T. dearborni*.



SPECIES PREVIOUSLY REFERRED AS  
*THYASIRA*

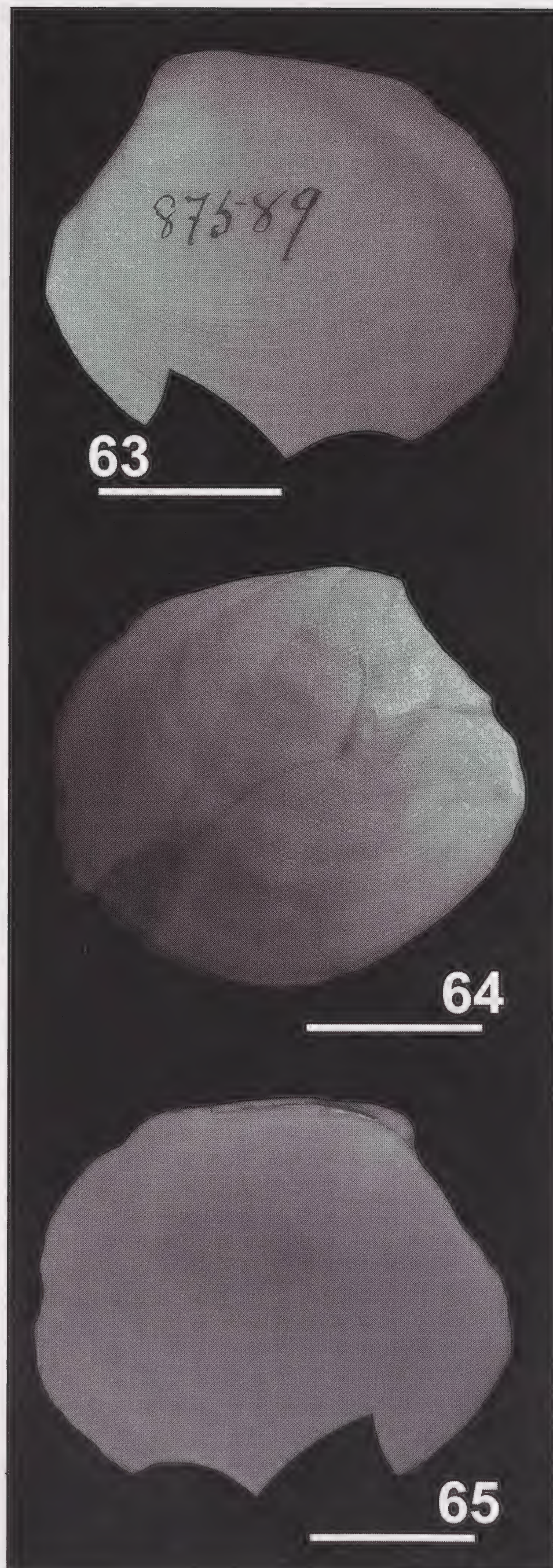
*Conchocele fuegiensis* (Dall, 1890), new combination (Figs. 63–65). This species, described from 53°06'00'S, 70°40'30"W, Magellan Strait, 142 m, was originally placed under the genus *Cryptodon* Turton, 1827, and reported latter under its senior synonym, *Thyasira*, by Dall (1901). In the present study, the species is reallocated into *Conchocele* Gabb, 1866, based on its large size (holotype 26.3 mm L), elongate shell outline with anteriorly displaced beaks, deep submarginal sulcus, and presence of a marginal sinus; these characters were considered as diagnostic for *Conchocele* by Coan et al. (2000) and Oliver & Sellanes (2005).

*Conchocele fuegiensis* resembles *Conchocele bisecta* (Conrad, 1849) from the northern Pacific Ocean but differs by having a bisinuate posterior margin. Furthermore, in *C. bisecta* the beaks are at anterior end, and the anterior margin slopes almost vertically, while in *C. fuegiensis* the beaks are subterminal and the anterior margin is slightly projecting. Oliver & Sellanes (2005) reported specimens from off Concepción (Chile) as *Conchocele* sp. These specimens differ from *C. fuegiensis* by having a concave anterior margin and single posterior sinus.

NOMEN DUBIA

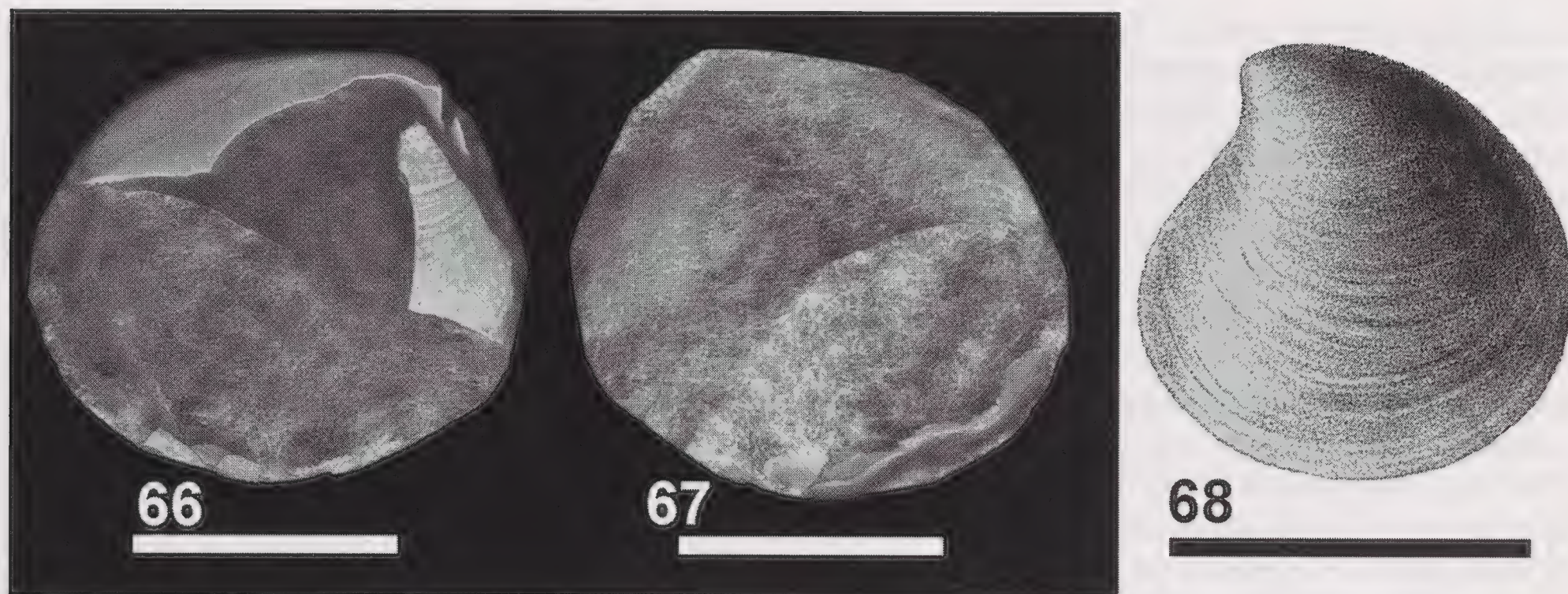
*Loripes pertenuis* Smith E. A., 1881 (Figs. 66, 67) was described from the Magellan Strait. Soot Ryen (1959) suggested that the species might be placed under *Thyasira* and be a synonym of *T. magellanica* (*Parathyasira* in this study). However, the original description and figure of *Loripes pertenuis* show clearly an obliquely subcircular shell outline, with anteriorly displaced beaks and bisinuate posterior margin; this set of characters do not agree with those of *P. magellanica*, fitting instead with the concept of *Conchocele fuegiensis*; however, the rather poor state of preservation of the type specimen of *Loripes pertenuis* prevent us to confirm the relationship of these two species.

*Axinus bongraini* Lamy, 1911, was described from Petermann Island [65°11'S, 64°10'W, west of the Antarctic Peninsula]. The single type specimen (MNHN) is not informative because it is now completely fragmented; the original description of the species is poor and does not provide any anatomical information. The subsequent figure by Lamy (1911b) disregards relevant morphological details such as the morphology of the pos-



FIGS. 63–65. *Conchocele fuegiensis*. Holotype (USNM 87589). FIG. 63: Outer view left valve; FIG. 64: Outer view right valve; FIG. 65: Inner view left valve. Scale bars = 10 mm.





FIGS. 66–68. Species remaining as *nomen dubia*. FIGS. 66, 67: *Loripes pertenuis*, holotype (NHM 1879.10.15.72); FIG. 66: Right valve; FIG. 67: Left “valve”; FIG. 68: *Axinus bongraini*, original figure by Lamy (1911b, pl. 1, fig. 17). Scale bars = 5 mm.

terior area (i.e., the presence of auricle, sulcus, and sinus) and hinge plate. Due to this, *Axinus bongraini* is regarded as a *nomen dubium*. Dell (1990) pointed that “the identity of Lamy’s [*Axinus*] *bongraini* cannot ... be readily determined”; despite this, the author suggested it might be a synonym of *Parathyasira dearborni*. However, none of the specimens of *Parathyasira dearborni* studied here showed a ventral margin so evenly rounded as it was figured by Lamy (1911b), for which Dell’s opinion is not shared.

Nicol (1966) and Hain (1990) reported *Axinus bongraini* (under *Genaxinus*) as a synonym of *Thyasira debilis*. However, the smaller shell, with ovate shell outline, strongly projecting anterior end, and nearly undifferentiated posterior area of *T. debilis*, clearly preclude these two species being synonyms.

The specimens reported by Dell (1964) as *Thyasira* cf. *bongraini* (NHM 1964752) and those reported by Mühlenhardt Siegel (1989) as *Thyasira bongraini* (ZMH, in part) are here reassigned to *Parathyasira dearborni*.

Egorova (1982) assigned to *Thyasira bongraini* specimens from Davis Sea (East Antarctica). However, the figures provided (Egorova, 1982: figs. 311–313) show a wide auricle and a prominently differentiated lunule, two characters not reported in the original description nor figured by Lamy (1911b) for the species.

## DISCUSSION

The identity of the Magellanic and Antarctic thyasirids has been confusing. Several facts have contributed to this situation, among them,

some species names, such as *Thyasira bongraini*, were applied erroneously to refers to *Parathyasira dearborni* or *Thyasira debilis*; in other cases, species were wrongly assigned to the genera *Genaxinus*, in the case of *Thyasira debilis*, or *Thyasira* for *Conchocele fuegiensis*. This situation seems to have originated from the vague, poorly detailed, original descriptions, as well as in from the few specimens upon which several species were based. The present study has addressed this problem by revising all species reported for the area, with descriptions and illustrations of all traceable types, as well as numerous additional specimens from the Magellanic and Antarctic waters, giving attention to morphological and anatomical characters, as well as intraspecific variability.

Five thyasirid species previously described from the Magellanic and Antarctic waters are considered valid: *Thyasira debilis*, *T. falklandica*, *Parathyasira magellanica*, *P. dearborni*, and *Conchocele fuegiensis*; a sixth species, ***Thyasira scotiana*** from the Scotia Arc Islands, is here described; and *Loripes pertenuis* and *Axinus bongraini*, the other two species previously assigned to *Thyasira*, are considered *nomen dubia*. These species are known only from the type material, and the state of preservation of these specimens precludes any well-based conclusion on the status of these taxa.

## Shell Morphology and Soft Part Anatomy

Taking into account the shell morphology, *Conchocele fuegiensis* appears the most easily distinguished thyasirid in Magellanic and Antarctic waters: its large size, elongate shell outline,



anteriorly placed beaks, bisinuate posterior margin, and elongate anterior adductor muscle scar are diagnostic. Other thyasirid species with an elongate (longer than high) shell outline are *Thyasira debilis* and *T. falklandica*. Both of them are smaller than *Conchocele fuegiensis*. Furthermore, in the former the beaks are posteriorly located, the anterior end is more prominently projecting, and the posterior area is only slightly flattened. In *T. falklandica* the beaks are subcentral and there is only one posterior sinus. The remaining three species from the area have subcircular (***Thyasira scotiana***), subquadrate (*Parathyasira magellanica*), or rhomboidal (*P. bongraini*) shell outlines, that is, shells as high as long or higher than long.

The size of the protoconch is similar in *Parathyasira magellanica*, *P. dearborni*, and *Thyasira debilis*, ranging from 115 to 135  $\mu\text{m}$  in diameter, but in ***T. scotiana*** the protoconch is considerably larger (about 210  $\mu\text{m}$ ); this character is unknown in *Thyasira falklandica*. Regarding protoconch sculpture, two patterns may be recognized: *Thyasira debilis* has a smooth protoconch, while *Parathyasira magellanica*, *P. dearborni*, and ***T. scotiana*** show a series of prominent radial folds symmetrically arranged along a main central axis (this pattern is being reported for the first time in thyasirids).

All studied species have a narrow hinge plate. *Parathyasira magellanica*, *P. dearborni*, ***Thyasira scotiana***, and *T. falklandica* have no hinge teeth, while *Thyasira debilis* shows a prominent anterior tubercle in the right valve.

In *Parathyasira magellanica*, *P. dearborni*, ***Thyasira scotiana***, and *T. debilis*, the gill is composed by two, inner and outer, demibranchs. In *Parathyasira magellanica* and *P. dearborni*, the ascending lamellae of the outer demibranch are a half the high of descending lamella, while in *Thyasira debilis* the descending lamellae are extremely short.

The digestive gland appears widely laterally expanded in all the species in which anatomy was studied. In *Parathyasira magellanica* and *P. dearborni*, it is large and multilobed; on the other hand, *Thyasira debilis* has a proportionally smaller and poorly lobed digestive gland, a condition resembling that in *T. gouldi* (Philippi, 1845), *T. succisa* (Jeffreys, 1876), and *T. obsoleta* (Verrill & Bush, 1898).

The mantle margin of *Parathyasira magellanica* and *Thyasira debilis*, as well as other species of the genus for which the anatomy is known, is largely free, determining a relatively large pedal aperture and a small posterior exhalant opening. *Parathyasira dearborni* has a comparatively shorter pedal aperture, determined by the pres-

ence of a larger presiphonal suture, and two posterior openings.

#### Generic Assignment of Species

*Parathyasira magellanica* and *P. dearborni* were formerly reported under *Thyasira*, however, they have a subquadrate to rhomboidal shell outline ("pyriform" or "polygonal" of authors), almost vertical submarginal sulcus with sharp border, flat to almost flat posterior area, and absence of auricle; this set of characters were recognized as diagnostic of *Parathyasira* (Payne & Allen, 1991; Oliver & Killeen, 2002; Oliver & Holmes, 2006). This two species show differences in the number of posterior openings, one in *P. magellanica*, two in *P. dearborni*. The presence of two posterior openings could be viewed as a valuable character for an eventual generic splitting; however, this is not possible at the present state of knowledge of thyasirids. Anatomical details of the type species of *Parathyasira* are unknown. Payne & Allen (1991) pointed out on the great variation in the degree of mantle margin fusion among the species they referred to as members of *Parathyasira*. The authors reported in some species the occurrence of temporary adhesions of the mantle margin, to form an "inhalant" aperture. This condition clearly differs from that present in *Parathyasira dearborni*, where the apertures are not temporary but permanent (i.e., the mantle margins are fused above and below both apertures).

*Thyasira debilis* was originally described under the genus *Axinopsis* Sars, 1878. However, this species clearly differs from the type species of *Axinopsida* Keen & Chavan (in Chavan), 1951 (*nomen novum pro Axinopsis* Sars, 1878, *non* Tate, 1868), *A. orbiculata* Sars, 1878, which is characterized by having a suborbicular shell outline, concave lunule margin, and ovate-elongate muscle scars. None of these characters are present in *T. debilis*. Dell (1964), based on the similarities of this species "with a New Zealand group of species classified under *Genaxinus* by Fleming (1950)" [i.e., "*Genaxinus*" *cookianus* Fleming, 1950, and "*Genaxinus*" *otagoensis* (Suter, 1913)], transferred *Thyasira debilis* to *Genaxinus* Iredale, 1930. This generic assignment was subsequently widely used in the Antarctic literature. *Thyasira debilis* is actually similar in shell morphology to the New Zealand species reported by Fleming under *Genaxinus*, but all these species differ strikingly from *Thyasira albigena* Hedley, 1907, the type species of *Genaxinus*. That species is characterized by a higher than long shell, with subcentral beaks, edentulous hinge plate, and large, elongate,



similar in size anterior and posterior muscle scars. On the contrary, in the Antarctic and New Zealand species the shell outline is subovate (longer than high), with posterior beaks, the anterior end prominently projecting, the muscle scars are small and unequal, and hinge with a prominent tubercle.

The reallocation of *Axinopsis debilis* Thiele under *Thyasira*, as proposed here, is based on the morphological and anatomical characters of the species, namely, the presence of a shell with elongate anterior adductor scar, ovate posterior adductor scar, vermiform foot, and two demi-branches. These characters were recognized as diagnostic for *Thyasira* by Oliver & Killeen (2002), Oliver & Sellanes (2005), and Oliver & Holmes (2006). However, *T. debilis* lacks the characteristic bisulcated and bisinuated posterior margin, reported by Oliver & Killeen (2002) for *Thyasira* s.s. In addition, *T. debilis* has a relatively small, poorly lobed digestive gland, which is in contrast with the “large and multilobed” gland described by Oliver & Holmes (2006) for the genus. Despite that, the morphology of the digestive gland of *T. debilis* is similar to that present in *Thyasira succisa* (Jeffreys, 1876), a species retained under *Thyasira* in the most recent revisions (Payne & Allen, 1991; Oliver & Killeen, 2002). With that species, *T. debilis* also share the presence of extremely short descending lamellae of outer demibranch, an ovate shell outline, and a cardinal tubercle in hinge. These morphological characters are also present in “*Genaxinus*” *cookianus*, “*Genaxinus*” *otagoensis*, and *Thyasira succisa atlantica* Payne & Allen, 1991, suggesting that all of them might represent a distinct (sub)genus. But as “the current definitions of the genera of the Thyasiridae are poor and inadequately reflect the diversity of shell and anatomy”, as stated by Oliver & Holmes (2006), I prefer to be conservative and do not introduce any new generic names.

*Thyasira falklandica* and *T. scotiana* also lack a bisinuated posterior margin, but as the soft part anatomy of the species is also unknown, a discussion on their generic placement is postponed. In the meanwhile, they are retained as *Thyasira* s.l., as was done by Oliver & Holmes (2006) for some species of the Northern Hemisphere.

#### Distribution of the Species

Among the thyasirid species recognized as valid in the present study, *Thyasira debilis* appears as the most widespread distributed: occurring around Antarctica, from the Ross Sea to the Davis Sea, extending northwards up to Tierra del Fuego in the Magellan Region. The remaining

five species seems to have a more restricted geographic distributions, occurring in the Magellanic (*Parathyasira magellanica*, *Thyasira falklandica*, and *Conchocele fuegiensis*) or the Antarctic (*Parathyasira dearborni* and *Thyasira scotiana*) waters. Within the Magellan Region, *Parathyasira magellanica* and *Conchocele fuegiensis* are known from the Beagle Channel and the Strait of Magellan, extending northward the west coast of Patagonia, to Chiloé Islands (Dall, 1901; Soot Ryen, 1959); and *T. falklandica* from the vicinity of the type locality in the Malvinas Islands. Among the Antarctic species, *P. dearborni* was recorded from the Ross Sea to the Weddell Sea, extending northward up to the southernmost islands of the Scotia Arc; and *T. scotiana* is thus far only known from the type locality.

In addition to its wide geographic distributional range, *Thyasira debilis* also exhibits a wide bathymetrical range, occurring from the shallow waters up to 1,279 m depth. The species with the narrowest bathymetric ranges are *Thyasira scotiana* and *Thyasira falklandica*. The remaining three species, although restricted to a single biogeographic realm (Antarctic or Magellan Region), all surpass the outer limits of the continental shelf: *T. dearborni* is present to 1,180 m depth (Dell, 1990); *Thyasira magellanica* to 522 m depth (this study); and *Conchocele fuegiensis* to 822 m depth (Dall, 1901). These results seem to indicate that depth itself is not limiting species distribution.

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